Space Weather Forecast

Issued on Sunday, 03 December 2023 at 01:11 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Chance of further Moderate-Class flares (R1-R2 Blackouts). G1-G2 (Minor-Moderate geomagnetic storms) likely day 2 and 3 (04 and 05 Dec).

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity is at Low levels with the largest flare of the previous 24 hours a mid-Common class flare from the long-period decline of the Moderate flare from the largest region on the disc, in the southwest, that peaked at 01/2120 UTC. There are currently seven sunspot regions. A moderately sized, rather complex region in the southwest remains the largest and most significant region, however some reduction in size and simplification in its magnetic structure was observed during the period. A small, somewhat complex region in the northwest developed, then began to simplify. The remaining regions on the visible disc are all mature and stable spots.

Despite a number of coronal mass ejection (CME) signatures evidenced in solar imagery during the past 24 hours, none are considered Earth-directed.

Solar Wind / Geomagnetic Activity: Solar wind speeds began at Elevated levels, with a peak of 526km/s at 02/0000 UTC. Speeds declined through the period to become Slightly Elevated, around 420km/s by the end of the period. The Interplanetary Magnetic Field (IMF) was initially Strong, but gradually weakened to become Moderate. The important north-south component of the IMF was Moderately negative at first, but became Moderately positive from 02/0700 UTC onwards.

Resultant Geomagnetic activity was initially at G1/Minor Storm levels from 02/0000-0300 UTC, then Active (Kp4) from 02/0300-0600 UTC, but have eased to Quiet (Kp 0-2) levels since then.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) persisted at Background levels with no solar radiation storms occurring.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to be Low with a chance for isolated Moderate flares (R1-R2 Blackout), and a very slight chance of an isolated Strong flare (R3 Blackout) on days 1-2 (03-04 Dec). The bulk of the significant flare risk is attributed to the moderately large sunspot region in the southwest.

Solar Winds / Geomagnetic Activity: A CME that left the sun late on 01 Dec has a chance to give a glancing impact at Earth late day 2 (04 Dec) or early day 3 (05 Dec), otherwise no Earth-directed CMEs feature in the forecast period. Solar winds are continuing to ease following the notable CME arrival on 01 Dec. Speeds should fall from Slightly Elevated to Background levels on day 2 (04 Dec) and remain at similar levels until the next solar wind enhancement from a large coronal hole currently moving into the western hemisphere. Speeds should increase to Elevated or Strong levels with this feature, starting from late day 2 (04 Dec) or early day 3 (05

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Dec) and likely persisting into day 4 (06 Dec).

Geomagnetic activity is expected to be Quiet to Unsettled on day 1 (03 Dec) and much of day 2 (04 Dec), then forecast to increase to G1-G2/Minor-Moderate Storm (Kp5-6) levels late day 2 or day 3 (05 Dec). Following peak geomagnetic activity, indices should fall to Active to Unsettled by the end of day 3 (05 Dec), before becoming Quiet to Unsettled on day 4 (06 Dec).

Aurora: Auroral activity has returned to background levels following the notable CME arrival at Earth on 01 Dec. Little change is expected until day 2 or 3 (04 or 05 Dec) when the onset of faster solar winds should enhance the auroral oval once again. From the UK views of aurora may be possible from as far south as Northern England and Ireland.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is expected to remain at Background levels with just a very Slight Chance of exceeding the S1 Minor Radiation Storm threshold should any significant flares or notable filament eruptions (arc of the sun's material) take place.

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Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	1	70	50	5
Strong	G3	No	1	10	5	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	No	45	45	30	10
Very Active	R3 to R5 X	No	5	5	3	1

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	10	10	5
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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